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On the relevance of Compton scattering for the soft X-ray spectra of hot DA white dwarfs

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Abstract

Aims. We re-examine the effects of Compton scattering on the emergent spectra of hot DA white dwarfs in the soft X-ray range. Earlier studies have implied that sensitive X-ray observations at wavelengths λ < 50 Å might be capable of probing the flux deficits predicted by the redistribution of electron-scattered X-ray photons toward longer wavelengths. Methods. We adopt two independent numerical approaches to the inclusion of Compton scattering in the computation of pure hydrogen atmospheres in hydrostatic equilibrium. One employs the Kompaneets diffusion approximation formalism, while the other uses the cross-sections and redistribution functions of Guilbert. Models and emergent spectra are computed for stellar parameters representative of HZ 43 and Sirius B, and for models with an effective temperature Teff = 100 000 K. Results. The differences between emergent spectra computed for Compton and Thomson scattering cases are completely negligible in the case of both HZ 43 and Sirius B models, and are also negligible for all practical purposes for models with temperatures as high as Teff = 100 000 K. Models of the soft X-ray flux from these stars are instead dominated by uncertainties in their fundamental parameters. © ESO 2006.

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Keywords

Methods: numerical, Radiative transfer, Scattering, Stars: atmospheres, Stars: white dwarfs, X-rays: stars